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Charles M. Ziegler
State Highway Commissioner

FIELD TESTS

of

REFLECTORIZED TRAFFIC STRIPES

E. L. Peterson

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FIELD TESTS OF REFLECTORIZED TRAFFIC STRIPES

In August, 1947, a study of reflectorized pavement marking was undertaken by the Research Laboratory with the active cooperation of the Maintenance Division. This study was to embrace both laboratory and field tests designed to furnish data upon which to base adequate specifications for materials and methods of application.

The first progress report of the investigation, Report No. 115, titled "Operational Comparison of Premixed and M.S.H.D. Specification Materials for Reflectorized Centerlines", contained a description of tests conducted in Grand Rapids on US-131 and near Lansing on US-16. The purpose of both these experiments was to compare premixed materials, "beads in paint", with Department specification materials and methods, "beads on paint". Operational difficulties were encountered during application of the materials on both projects which makes comparison difficult. However, subsequent periodic observations of these experimental lines strongly indicate that the beads in paint produce a more durable traffic stripe, but one lower in initial brightness than beads on paint. It was discovered in the tests on US-16 that application of extra beads to the "beads in paint" mixture markedly increased the initial brightness of these materials.

This is the second progress report of the investigation and presents the results obtained to date from a third experimental section of traffic stripes put down on the north roadway of Michigan Avenue between Lansing and East Lansing in November, 1948. This investigation developed as a result of Laboratory studies and difficulties encountered with large paint striping equipment used on previously mentioned test sections.

Description of Tests

The experimental section on Michigan Avenue was applied jointly by the Research Laboratory and the Maintenance Division. A schematic diagram of the test section is shown in Figure 1. The original objectives of this experiment were fourfold:

(a) to study the effect of bead grading on reflectance and durability, and to determine the degree of correlation of the laboratory wear test to actual road performance.

(b) to determine the practicability of duplicating actual application conditions while retaining the accuracy necessary for testing, and to develop procedures and equipment for field testing purposes.

(c) to obtain comparative reflectance and durability data for "beads in paint" and "beads on paint" types of materials.

(d) to obtain comparative reflectance and durability data for the several materials used by the Department during the past few years.

The results of this experiment are incomplete at this time, as regards reflectance and durability studies, although reflectance and durability data obtained thus far are presented. Gradation and laboratory wear test correlation studies are also incomplete, and are omitted from this report. It was found that the procedure and equipment used did not yield the desired degree of control, although actual conditions were duplicated fairly well.

Materials: The materials used for this experiment were obtained from existing Department stocks. The samples of Prismo Lifeline paint were obtained from Kalamazoo county. These materials are identified in the data summary (Table I.)

Procedure: The materials were applied with a small machine (see Figure 2).

Figure 2. Experimental Traffic Stripe Machine

embodying the same principles as the existing equipment of the Maintenance Division. The machine was pushed by an operator who controlled all phases of the application. The rate of paint application was controlled by the walking speed of the operator. The glass beads were automatically metered onto the line, exactly as on the larger equipment. The chief uncertainty in the application obviously was the operator's walking speed. This uncertainty was reduced, as much as possible, by putting down several dummy lines until good reproducib ility was obtained.

The weight of beads dispensed was read directly from the graduated bead container. The volume of paint used was obtained by dip-stick measurement of the paint in the paint tank before and after each group of lines was applied. It was necessary to vary the air pressures used on the paint and atomizer lines, since the viscosities of the various paints differed considerably.

The paint thickness was measured, for "beads on paint" by applying one line without beads and measuring its thickness on a metal panel placed in the line. A check on this measurement was obtained by calculating the average thickness from the volume of paint used for each group of lines. It was not possible to measure the thickness of the " beads in paint" lines due to the presence of the beads.

Due to the number of trials necessary to properly adjust the equipment, a considerable number of lines were applied which were not suitable for the experiment. These lines were not numbered, and were not considered for evaluation. Because it was necessary to keep traffic moving, only the two south lanes of the north roadway were used for the experiment.

The yellow lines applied to the north lane were merely fillers to keep the traffic from dodging the test lines. Lines 50-55 were voided for this experiment because the paint available was insufficient for proper application.

Discussion of Results

The data in Table I show that the conditions of actual field application were duplicated fairly well. However, control of the paint rate was very difficult. The paint rate control should be improved for testing purposes, preferably by means of a flow controller such as is used for metering liquids in the chemical industry. Another means of improving the paint rate would be to pull the paint machine at a constant rate by means of a motor-driven pulley. This, however, would be more difficult, due to viscosity variations in the paint.

The control of the bead rate was good, although the volume of beads dispensed should be increased to meet the application rate of 90 pounds per mile generally used in practice. Some initial irregularity in bead distribution was noticed on the first lines applied. This was found to be caused by whipping of the flexible cable driving the bead dispenser, and was corrected before any applications for comparison of materials were made.

The comparative reflectance and durability observations have not been completed. However, some information on the present condition of the lines has been obtained. From the durability viewpoint, the materials fall into three fairly distinct groups at present. Figure 3 illustrates the groups of lines evaluated below.

Best.

20-23	1947	MSHD 20-F, yellow, Mfg. by Prismo Co.
24-27	1947	" 21-F, white, " " " "
28-31	1948	" 20-F, yellow, " " Franche Co.
39-41	1948	Centerlite, white, " " MMM Co.
42-44	1948	Spherebinder Compound, yellow, Mfg. by Prismo Co.

Intermediate

12-14	1948	Prismo Lifeline, yellow, Mfg. by Prismo Co.
36-38	1948	Centerlite, yellow, Mfg. by MMM Co.

Poor

16-19	1948	Prismo Lifeline, white, Mfg. by Prismo Co.
32-35	1948	MSHD 21-F, white, Mfg. by Acme Co.
45-47	1948	Spherebinder Compound, white, Mfg. by Prismo Co.

Although the average paint thickness varied considerably between various paints (see Table I), it did not seem to appreciably influence the present condition of the lines. This is shown by the fact that both the very thick and very thin lines are found in each of the best, intermediate, and poor ratings. The various materials will not necessarily remain in the same order of durability at the completion of the test as they are shown above.

Although the tests have not progressed very far, the curves of Figure 4 show that the "beads on paint" generally exhibited a high initial reflectance with a fairly rapid decrease, while the "beads in paint" exhibited a low initial reflectance with a gradual increase. This is to be expected with these materials from the observations made previously on Lansing US-16, and Grand Rapids US-131 test sections. The lines containing MSHD 20-F yellow paint bought in 1947 and 1948 appear to have improved in reflectance during the past two months.

The single lines of paint without beads, applied with each group do not give conclusive information. In some cases the plain paint appeared to be in poorer condition than the beaded paint, while in other cases the reverse was true. Generally, both the plain paint and the "beads in paint" presented a better daytime appearance than the "beads on paint". This was probably due to dirt accumulating between the beads of the "beads on paint" which would not interfere with night reflectance.

Summary

From the durability viewpoint the materials at present fall into three fairly distinct groups, which do not appear to be influenced by paint thickness. The reflectance data was incomplete, but generally exhibited the normal trends for the "beads in paint" and "beads on paint". Daytime appearance of the plain paint and the "beads in paint" was appreciably better than that of the "beads on paint". Both high initial reflectance and high final reflectance with durability might be achieved by the application of extra beads to a "beads in paint" material, as was done on US-16 west of Lansing. Paints made by different manufacturers according to the same formula specification appear to have markedly different performance characteristics.

Conclusions and Recommendations

It is not believed that this experiment would constitute a satisfactory basis for the purchase of materials.

It is suggested that a field scale trial be made, applying extra beads in varying amounts to a premixed material with varying bead content. By this means the composition for optimum performance might be ascertained.